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Title:	Improving the Elution Rate of Extraction Chromatography on the Purification of Americium
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IMPROVING THE ELUTION RATE OF EXTRACTION CHROMATOGRAPHY ON THE PURIFICATION OF AMERICIUM

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PAPER CRITIQUE

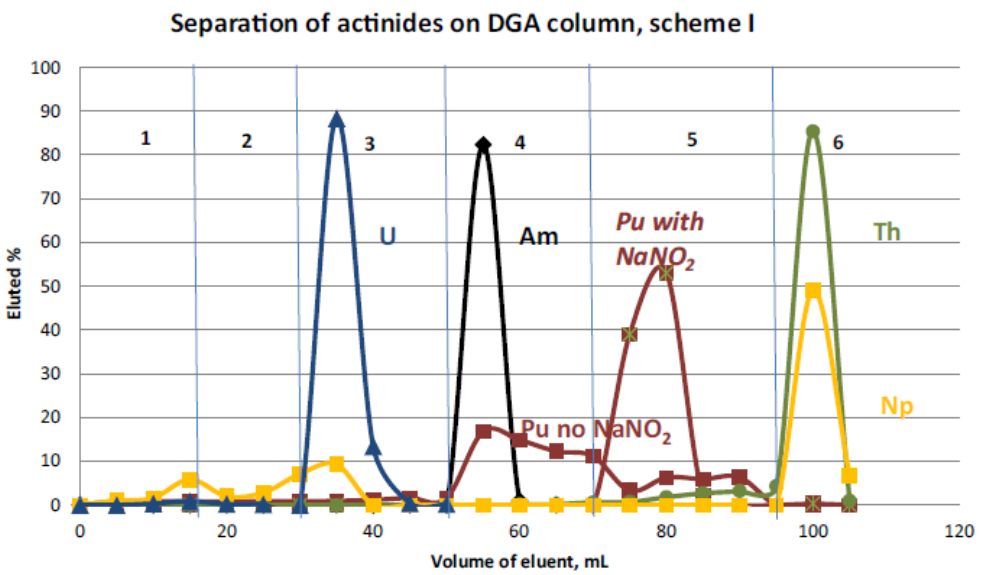
J. Groska, *et. al.*, *Determination of actinides in radioactive waste after separation on a single DGA resin column*

J Radioanal. Nucl. Chem., 309 (2016) pp.1145-1158

- EC used to separate multiple actinides (U, Pu, Np, Am) on a single column
  - +4 and +6 cations (Pu, U, Th, Np) separated from +3 cations (Am, Cm)
  - 50-100μm DGA resin in acid media
- Reason for field
  - Contamination due to radioactivity of actinides
  - Purity of actinides preferred

OPINION OF PAPER

- Novelty of the method is well defined and apparent
- Paper is easy to read and the figures are well-constructed, supportive, and all-inclusive
- Successes *and failures* are reported



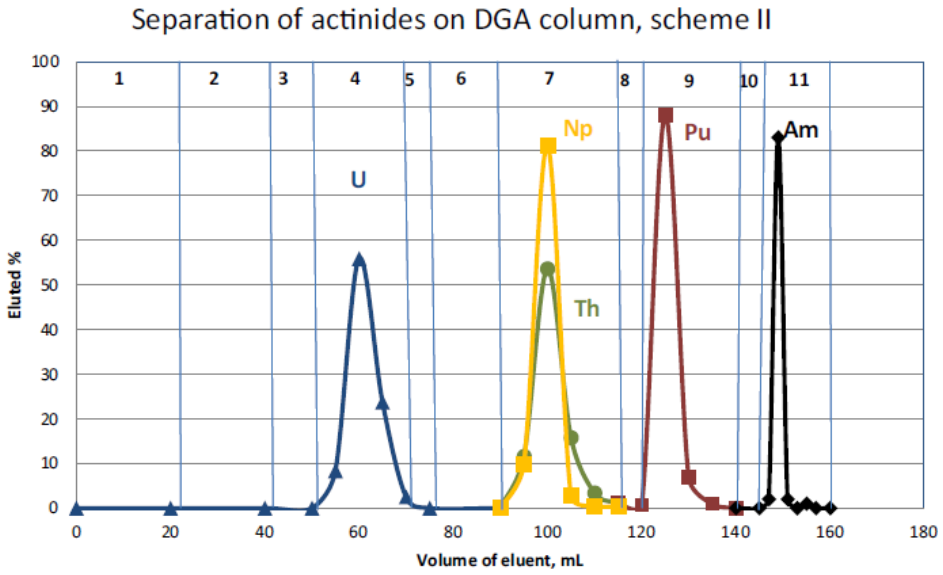


Figure 1: Comparison of elution results from scheme I (left) and scheme II (right). (J. Groska et. al.)

MOTIVATION/NEED FOR WORK

- J. Groska *et. al.* discusses issues with elution rate
  - *"Often slow and irreproducible"*
- LANL uses EC to purify Am
  - Same DGA resin is used to separate Am from Pu in purification process
- EC is rate limiting step of purification
  - Up to 25 days spent washing, loading, and eluting

NOVELTY/LITERATURE REVIEW

- Demand for ^{241}Am rising
  - Used in ionizing smoke detectors
  - Well logging
    - Oil and gas exploration
  - Capability to produce purified Am product quickly
- Very little research on separation of Am using EC
  - Rate of elution hasn't been examined in-depth

Figure 2:Well logging for underground oil and gas exploration(LANL LA-UR-16-24374)

GOALS

Manipulate resin size and porosity to obtain an optimal configuration to improve elution rate without adverse effect on separation

- Effects of resin size and porosity on flow can be easily tested
  - Test flow rates through various resin specs
  - Combine optimal specs to establish increased flow rate
- Larger resin shown to increase flow rates in non-actinide separations[1,2,9]
  - Lowers pressure drop across column
- Wetting characteristics of resin can effect porosity[2,3,4]
  - Altering wetting characteristics can lead to increased mobile phase velocity

METHODS

1. Flow rates will be evaluated by separately testing the effect of:
   - Resin size
   - Resin porosity
2. Ideal specs will be combined
   - Optimal flow rate will be determined
3. Recovery/purification of Americium will be tested
   - Efficiency of separation is paramount
   - Compare separation using alpha spectrometry

IMPACT

Increasing the rate of extraction chromatography will allow for:

- An increase in the number of batches processed per year
- Larger production of purified americium
- Milestones will be easily met and surpassed

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